NASA's JOURNEY TO MARS

Remarks by NASA Administrator Charles Bolden at
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AS PREPARED FOR DELIVERY

Thank you, Rudy deLeon and Peter Juul and thanks to everyone here at the Center for American Progress for allowing me to come in to share with you my perspectives on the future of space exploration for our nation.

There's a famous story about the Greek philosopher Thales. One day, Thales is walking along, looking up at the sky, mesmerized at the stars and he's so excited, so amazed, so taken by what he sees above him that he walks right into a well.

In a sense, that's the old way of thinking about space and space exploration – that somehow gazing up at the stars or thinking about all the possibilities the future has in store for us, distracts or takes us away from caring about what's going on here on Earth.

One of the things I admire most about my boss, President Obama is that he rejects this way of thinking. Instead, he believes, strongly that the things we do in space improve our quality of life here on Earth.

More than five years ago – April 15, 2010 to be precise, in what I consider to be a major space policy address –he offered a platform for space exploration at the Kennedy Space Center in Cape Canaveral, Florida. The President talked about the dual-purpose of extending humanity's presence farther into the universe while strengthening – at the very same time – our country's leadership here on Earth. He explained that these goals are really one in the same.

In a relatively short period of time, the space program has revolutionized the way we practice medicine, insulate our houses, purify our water, wear our eyeglasses, obtain television and radio signals, stay safe on our highways, protect or firefighters, feed our babies, power our electrical grid and lie down for a night's sleep. That, of course is only the short list. By the way, despite the popular misconception, we can't claim credit for Velcro or Tang!

Exploration has taught us more than we've ever known about our universe and our place in it. Data and imagery from satellites and the space scientists who interpret this information have educated us about our planet's changing climate. The International Space Station – which I believe ought to be considered for a Nobel Prize – has already taught us about what's possible when tens of thousands of people across 15 countries collaborate so that human beings from different nations can live and work in space.

Yet, for all these accomplishments, when you consider the possibilities ahead of us, there is really only one conclusion that can be reached: we're just getting started.

When I think about "American Progress,' I think about my granddaughters. You see, I've been very blessed in my life. When I grew up in Columbia, South Carolina during the days of legal segregation, because of the color of my skin, I had to fight just to be considered for appointment to the United States Naval Academy. I never would have dreamed that I'd be talking to you not just as a 34-year veteran of the U.S. Marine Corps and an astronaut, but also as NASA Administrator serving under our first Black President. I've been blessed to be able to travel to nearly every corner of our world and I've been blessed to have seen our planet from space over the course of four Space Shuttle missions.

I can honestly tell you that out of everything I've seen, there is nothing quite as awe-inspiring as being able to look into the eyes of my three beautiful granddaughters – Mikaley, Kyra and Talia..

To me, "American Progress" is all about the world in which they'll grow up – the world where they'll someday raise their own children and grandchildren. When we talk about our *Journey to Mars* and when we talk about the next giant leaps in space exploration, we're talking about their generation.

I like to refer to this next generation as "the space generation" not only because of the places they'll go, but also because of the expansive way they look at our world, our universe and the possibilities that await them beyond life here on Earth.

When I've told my granddaughters we're on a *Journey to Mars*, they've asked me "why stop there?" In broader terms that's their attitude toward human possibility and American progress. "Why stop there?" Everything is possible.

With this in mind, I want to talk with you today about where I believe we can be headed as a country when it comes to space exploration and to the Earthly-benefits that come with it.

HOW WE GOT TO WHERE WE ARE TODAY

To put this into context, it's worth, just very briefly, thinking back to the events that brought us to the present moment.

Presidents since Dwight Eisenhower have floated the idea of going to Mars, but on February 1, 2003 tragedy struck when we lost Space Shuttle *Columbia*.
After giving things a long, hard look, the Columbia Accident Investigation Board made the recommendation that the Space Shuttle Program should be phased out.

The Shuttle had already had a remarkable, three decades long run like no other. I traveled to space four times on the Shuttle and I can tell you that I loved this spacecraft. There has never been a vehicle quite like it: a reusable spacecraft, with the beauty of an airplane – actually the world's largest glider – and the capacity to carry eight astronauts to space with a 60-foot payload bay.

But every technology evolves over time and although this was a decision to which I did not arrive lightly, I agreed with their recommendation, as did many in the space community at the time.

President George W. Bush agreed as well and he made what I believe was the right decision to direct the phase out of the Space Shuttle Program.

Fast-forward a few years to winter, 2009. Upon taking office, President Obama asked an independent committee chaired by former Lockheed CEO Norm Augustine to review the nation's plans for human spaceflight. The committee included astronauts, scientists, executives, educators, engineers and a retired Air Force General – people as distinguished as the late Sally Ride. Their findings, quite frankly, were sobering. I quote: *"The U.S. human spaceflight program appears to be on an unsustainable trajectory."*

A few months after the report's release, in April 2010, President Obama came to Cape Canaveral and laid out the plan I mentioned earlier.

This plan that would replace this unsustainable trajectory with a clear, affordable, financially sustainable and ambitious way forward … a way forward that would expand our presence deeper into the universe while strengthening our nation's leadership here at home.

THE PRESIDENT'S PLAN

The President's plan included ramping up robotic exploration of the solar system … commitment to completing development of the James Webb Space Telescope to build on Hubble's legacy, … and an increase in Earth Science missions that teach us about climate change and how to, potentially, reverse its impacts.

The centerpiece of the President's plan was (and is) a *Journey to Mars* that will culminate with sending American astronauts to an asteroid in the 2020s and the Red Planet in the 2030s.

To complete this Journey, the plan concentrates both on getting to deep space and on extending the life of the International Space Station in low-earth orbit enabled by a robust and dependable commercial launch system for cargo and crew as replacement for the Space Shuttle.

The reason that keeping the Space Station operational is so important is that it allows our astronauts to test the technologies that drive exploration. It also allows NASA to continue our study of the effects of long durations in space on the human body while allowing our astronauts to continue their work off the Earth for the benefit of Earth.

Meanwhile, the President called for deeper collaboration with entrepreneurs and other industry-partners on developing the new technologies that a mammoth undertaking like Mars requires.

These technologies have resulted in many planned and unexpected capabilities and products – like improved artificial limbs, memory foam, solar panels and so many other technologies originally developed for the space program that also have invaluable earthly-benefits.

Of course, collaborations such as these are also valuable because they create jobs and fuel economic growth.

WHERE WE ARE FIVE YEARS LATER

Five years after the President challenged NASA to send astronauts to Mars in the 2030s; we are closer to sending human beings to the Red Planet than ever before in human history.

Meanwhile, a new consensus is emerging in the scientific and policy communities around NASA's roadmap and timetable for making this happen.

In 2010 at the Kennedy Space Center, the President stood in front of a test-model of the *Orion* spacecraft– the technological foundation for future deep space missions – and pledged it would be readied for flight. Today, *Orion* has now flown farther into space than any spacecraft built for human passengers has flown in more than four decades, having completed its highly successful maiden flight on December 5th of last year.
The Space Launch System (SLS) rocket that will someday propel American astronauts to deep space has moved from concept to development and it's hitting critical milestones in its construction and assembly.

Meanwhile, we're moving forward with an Asteroid Redirect Mission that will test new capabilities (like advanced propulsion systems) that will be needed for future human expeditions to Mars.

After pledging to extend the life of the International Space Station for five years, the President has now extended it for ten – to at least 2024. American astronaut Scott Kelly is half way through his Year In Space and we'll be able to study the effects of such a long duration mission and to benchmark them with his twin brother Mark, who is here at home on Earth.

We recently announced that our Mars Reconnaissance Orbiter confirmed the existence of flowing water on Mars and we're on pace to send a new rover to the Red Planet in 2020 that will help us prepare for human arrival. For the first time ever, it will cache a sample for later return to Earth.

Meanwhile, our American industry partners are now launching cargo missions to the ISS – and they're doing it from U.S. soil.

To accomplish the President's goal of returning the launches of American astronauts to American soil, we've selected our commercial partners Boeing and SpaceX to produce their respective crew vehicles, *CST-100 Starliner* and *Crew Dragon*. We recently selected our commercial crew astronauts – the first four astronauts to train to fly to space on commercial carriers: Robert Behnken, Sunita Williams, Eric Boe and

Douglas Hurley – all experienced test pilots and shuttle astronauts. In fact, they met with President Obama at the White House just last week.

What we haven't yet been able to do is secure all the necessary funding to complete the Commercial Crew Program. Had we done so, we'd likely be preparing this year for those first commercial launches from Cape Canaveral. As things stand we'll continue to be in a bit of a holding pattern until we get the additional funding the President has been requesting, but I'm the eternal optimist and I believe we'll come to terms with Congress soon.

Maybe it's just me, but I believe that the greatest country on Earth shouldn't be solely reliant on other countries to get our own astronauts to space!

I should note that there are 350 companies working across 35 states toward the goal of bringing these launches home. So there is a lot at stake, not only in terms of discovery and exploration, but also in terms of job creation, growth and opportunity.

Across the board, our country's new technology economy is driving economic growth and NASA's work is providing significant fuel for that engine. We're exploring deep space, but we're anchored right here on Earth, where we're creating jobs and fueling innovation and growth … recognizing that without American ingenuity and innovation we would be right there in Thale's well!

Aside from all these measures of economic, scientific and technical progress, we've also been able to start to do something else – and that's to break through in the public's consciousness.

Whether it's the publicity (and excitement!) that surrounded the *New Horizons* encounter with Pluto this past summer and the Pluto-mania that followed, our recent confirmation of flowing water on Mars or the new Mars-enthusiasts who flocked to movies like The Martian, there's a tangible sense I get as I travel and meet folks that NASA is "en vogue" right now.

There's a coolness factor and when you're seeking to capture the public's hearts, minds and, above all, imagination – these things make a difference.

MARS MATTERS

With all this said, some of you – I hope it's just a few of you – might be asking, ok, but why does all this matter? Why go to Mars?

This brings us to the "audience participation" part of our program. When I point to the audience, I want you to repeat after me …"Mars matters."

Because its formulation and evolution are comparable to Earth's … Mars matters.

Because we know that at one time it had conditions suitable for life … Mars matters.

Because what we learn about the Red Planet may tell us more about our own home planet's history and future … and because it might just help us unravel the age-old mystery about whether life exists beyond Earth… Mars matters.

WHERE ARE WE HEADED

When I think of the world in which my granddaughters will be raising their own children … I see a world where their kids view human beings living and working on Mars as a fact of life (much like they view living and working on the International Space Station today) … A future, where NASA and its international partners are using Mars as a stepping stone to the rest of the solar system.

I see a future, where a robust private space industry is launching human beings, cargo and satellites of all sizes to space at a significantly lower price-point – thanks to the work we're doing today to make launches more affordable and to advance emerging small-satellite technologies like "CubeSats" and "Nanosats."

… A future where the next great American company utilizes technologies developed for space travel to develop a product that improves our quality of life here on Earth.

… A future where flying from Washington to Los Angeles is a better experience both for people in the plane and on the ground because we've succeeded in reimagining air traffic management, and we've made flight cleaner, greener, safer and quieter. And by flight I mean both airplanes and helicopters.

I see a future where our grandchildren's children are drinking cleaner water, breathing cleaner air and making use of cleaner energy, not only because NASA has helped us better understand climate change, but because of the work our scientists are doing in areas like green aviation and water purification.

I see a future where fewer Americans are losing a sister or a son because the medical technologies we prefect to protect our astronauts from exposure to radiation on a long-duration spaceflight help revolutionize medicine.

Or because the technologies we've developed to detect signs of life on other planets continue to help emergency workers listen for beating hearts in the rubble after a disaster.

I see a world where girls and young people of color are more excited about pursuing education in science, technology, engineering, the arts and math. A world where, unlike today, there will no longer be any states in the Union where no women take the Advanced Placement AP Computer Science exam – thanks in part to NASA's work to promote STEM education and careers.

I see a future where people in even the most remote corners of our world have access to Wi-Fi – as do astronauts living and working in space.

I see a world where the stunning images being sent home to us from the James Webb Space Telescope teach my granddaughters and their kids more about our universe that has ever before been conceptualized.

I see a future where maybe, just maybe, humanity finds the answer to the age-old question – a question that Thales must have thought to himself as he stared up at the night sky – of whether we're alone in the universe.

CONCLUSION

While none of us can know for sure what the future has in store, there is one thing we can say with a good degree of certainty: none of these things can happen on their own. They will require future leaders to continue to make the choices that point us into this direction: Future presidents, future Administrators and future citizens.

President Obama has set us on a visionary course; it's my sincere hope that future leaders from all sides of the political spectrum see it through … because I truly believe the sort of future I laid out is within our grasp.

Right now the astronaut who will take the first human steps on Mars and the scientist who will discover the next great breakthrough that makes that step possible might very well be sitting in a classroom here in Washington, DC. Every choice that she – or he – makes to spend that extra half hour in the library or to sign-up for that extra elective, or frankly to pick up a guitar or a paintbrush for the very first time … all these choices bring us closer to the future that we all dream is and can be possible.

I had a friend who gave her life to the cause of human exploration named Christa McAuliffe and Christa once said that teaching allowed her to *"touch the future."*

I believe that we are at a teachable moment when it comes to the future of exploration. The question is what are we going to do with it? Are we going to seize this moment and use it to touch the future? I hope the answer is yes and I want to thank everyone at the Center for American Progress for doing your part to make help us seize this moment and make this answer yes.

I look forward to our discussion.